PROJECT FACT SHEET

CONTRACT TITLE: Characterization of Non-Darcy Multiphase Flow in Petroleum Bearing Formations

DATE REVIEWED: 01/11/93 **DATE REVISED:** 06/30/92

OBJECTIVE: The study will develop an accurate non-Darcy flow model that will contribute to more accurate reservoir management decisions. The non-Darcy flow coefficient developed would be applicable to flow regimes near the wellbore and in gravel packs of injection wells and in gas production wells. It can be used in reservoir simulators instead of the simplified correlations or assumption of Darcy conditions now used.

ID NUMBER: DE-AC22-90BC14659

B & R CODE: AC1510100

CONTRACT PERFORMANCE PERIOD:
05/14/90 to 05/13/93
PROGRAM:
RESEARCH AREA:

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SCHEDULED MILESTONES:

Use petrophysical models to relate flow properties to rock character	11/91
Complete theoretical models	03/92
Complete coreflood experiments	03/92
General model of non-Darcy flow	04/93

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	288	0	14	302
FISCAL YR 1993	0	0	0	0
FUTURE FUNDS	0	0	0	0
TOTAL EST'D FUNDS	288	0	14	302

PROJECT DESCRIPTION: Under this project, non-Darcy multiphase flow in various consolidated and unconsolidated porous media characteristic of hydraulically created propped fractures and gravel packs have been developed. A theoretical model will be developed using pore-scale modeling, unsteady-state displacement modeling, and dimensional analysis modeling. Experimental corefloods using consolidated rock, propped fractures and gravel packs will be conducted to provide data for correlations.

PRESENT STATUS: The theoretical aspects of the project are progressing ahead of schedule.

The experimental studies are slightly behind schedule due to delays experienced in securing critical components required to enhance the experimental facilities.

ACCOMPLISHMENTS: An improved method for characterizing multiphase flow parameters from unsteady-state displacement data using an integral formulation has been developed. The method is based on a new porous media flow model which can be used to determine phase parameters such as permeabilities, non-Darcy flow coefficients, capillary pressures and interfacial drag between phases from basic flow measurements for gas/liquid systems. A computer program has been developed to solve the multiphase flow models and determine the important rock and fluid properties mentioned previously. In the event this new method can be developed in an efficient manner it will represent a significant contribution to the technology of measuring these important rock and fluid properties.

Dimensional consistent correlations have been developed as a means of characterizing the non-Darcy flow coefficient as a function of reservoir rock and fluid properties. These correlations are useful in predicting reservoir and well performance using numerical simulators.

Enhanced laboratory facilities have been developed which are being used to experimentally investigate non-Darcy multiphase flow in consolidated and unconsolidated porous media. The fully automated facilities will permit researchers to more readily conduct experiments at in-situ reservoir conditions, and acquire and analyze the data in real time.

BACKGROUND: Deep, high-pressure wells as well as waterflood and EOR injection wells experience flow in the non-Darcy regime. The limited amount of theoretical work on non-Darcy flow has assumed single phase conditions, which rarely occur. Prior efforts to develop non-Darcy flow coefficients have met with controversy, in part due to the complication that any non-Darcy flow coefficient that is developed will be a function of both rock and fluid properties. This project will attempt to overcome the need for large numbers of experimentally determined values at various porosities and saturations by applying theoretical flow modeling and selected experiments to computer generate data from which to derive a coefficient.